Ground System Automation

-- GMSEC's GREAT, CAT and ANSR Tools --

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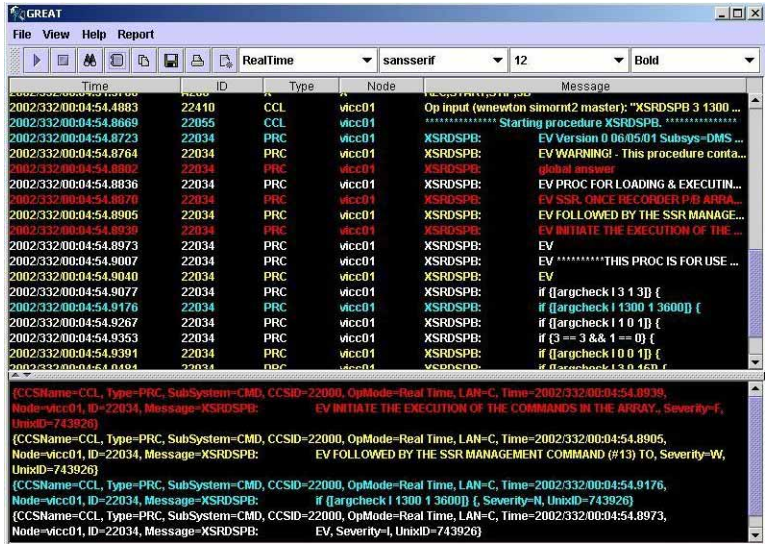
Goals, Objectives, Benefits

- Goal to develop a suite of user-configurable mission operations system automation tools
- The CAT, GREAT and ANSR tools allow for the monitoring of system message traffic and provide for automated responses/actions to recognized conditions.
  - These tools supplement others, including script and schedule execution packages
- Automation is needed to reduce operations costs, but also needed to reduce risk and enable more complex operational scenarios.
- Past approaches were either costly to configure or very limited in scope.

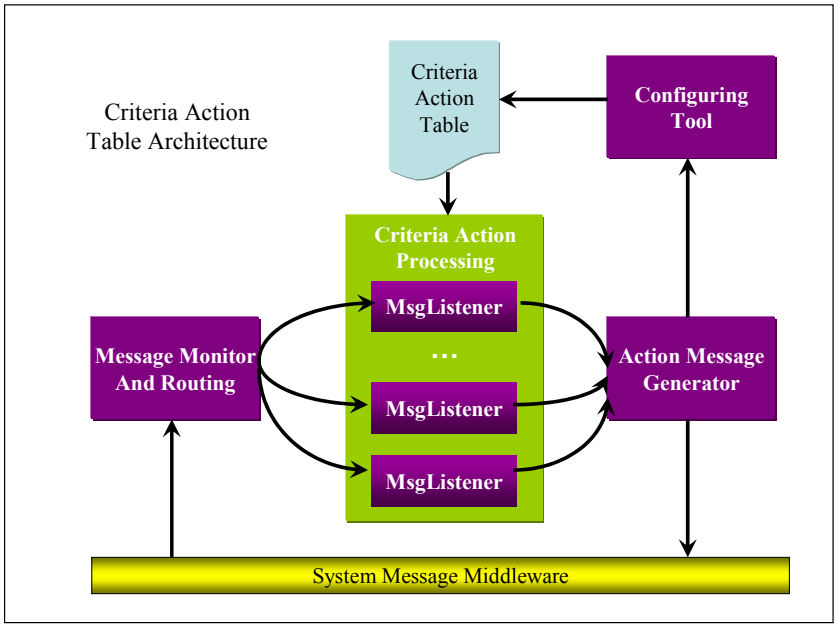
GREAT

- GMSEC Reusable Events Analysis Toolkit (GREAT)
  - Monitors GMSEC message bus for text event messages (can also support other types)
  - Provides display of messages from all sources. Users control filtering, columns, font, etc.
  - Provides message archive/retrieval function
  - Allows for report generation
- Extensive use of XML has allows for simple reconfiguration of the tool, specification of complex reports and control of archive requirements



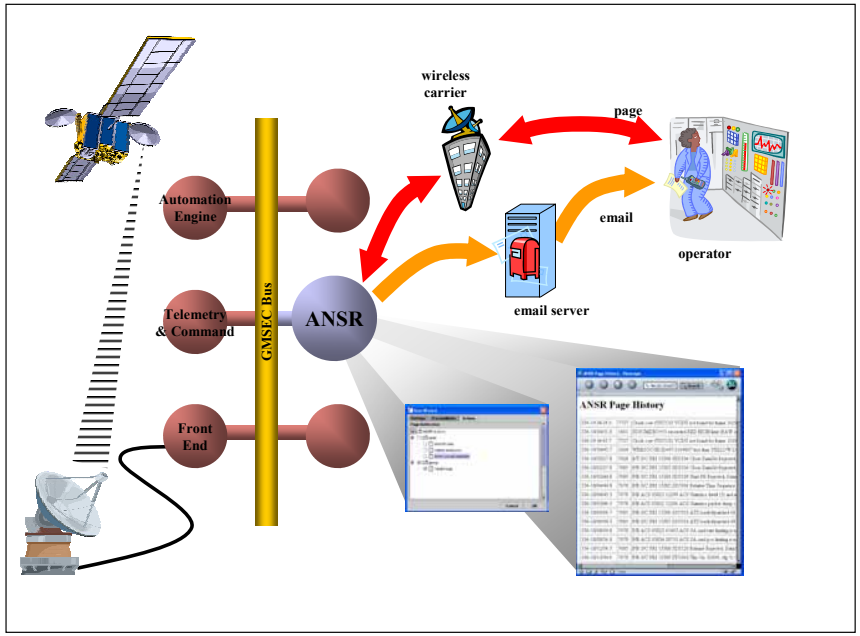
CAT

- GMSEC Criteria Action Table (CAT)
  - Like GREAT, CAT monitors the GMSEC bus for event message traffic
  - Messages compared against set of user-defined rules.
  - Once a full rule "criteria" has been met, then the defined action is taken
    - Page or E-mail someone (using ANSR)
    - Send a directive or new event message
    - Initiate an operating system command

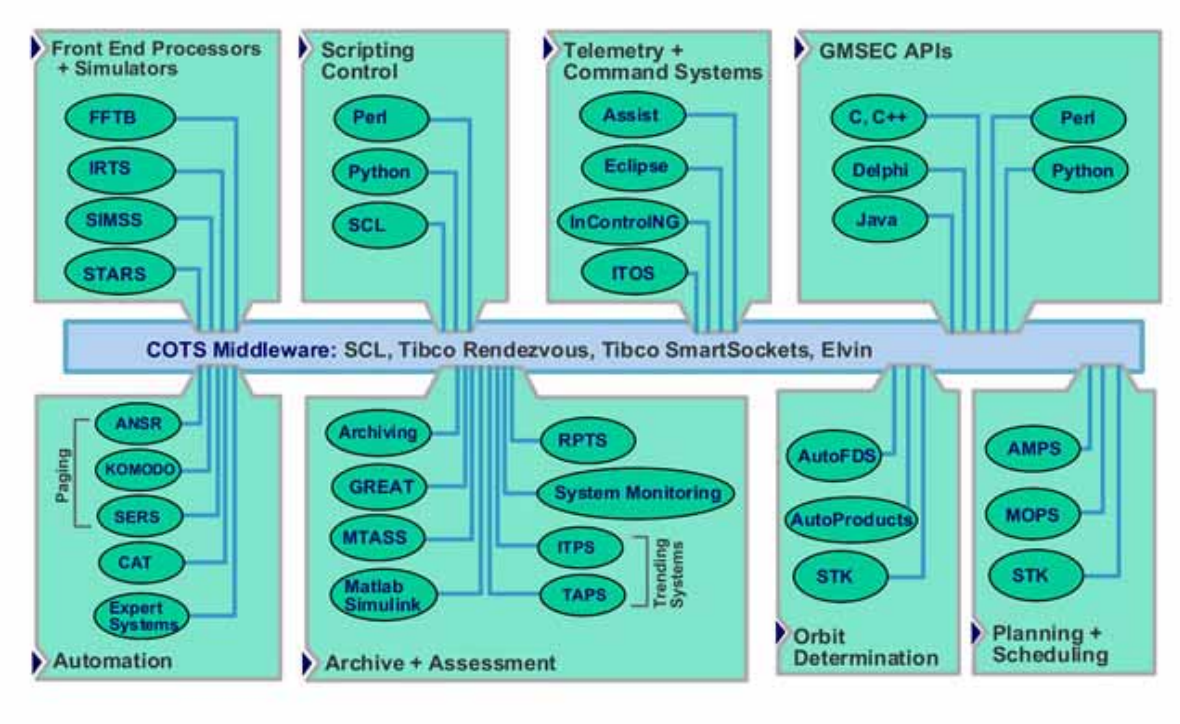


ANSR

- Alert Notification System Router (ANSR)
  - Accepts directives to send page or e-mail
  - Platform independent
  - Full calling tree in case of non-response
  - Displays log history
  - May even use to alert the person on console to a recognized condition



GMSEC System-Wide Automation



Any of the GMSEC components can issue messages on the bus and also receive directives to take action – these are two keys to system-wide automation approaches.

GMSEC System-Wide Automation

- A lot of mission operations automation requires information from multiple sources
  - GMSEC's message bus architecture allows tools to monitor the aggregate set of messages from the TLM/CMD system, the scheduler, flight dynamics, etc.
- Can now have simple rules for what had been complex checks
  - "If I don't get an actual AOS message within 2 minutes of my scheduled AOS, then . . ."
  - "If machine A and machine B lose communications, then switch to C and D for critical operations."
  - "If a pass has started but not ended, then keep track of how many commands were sent and how many limits violations were reported; generate a summary message at the end of the pass."
- By separating problem detection (event message generation) and action (per CAT), the automation rules can be centralized and better managed

Results, Status, Next Steps

- The GREAT/CAT/ANSR tool suite is just beginning operational use. The TRMM FOT has defined initial rules and are working on more.
- Initial comments show users are beginning to understand the new power and capabilities possible with this approach. Also that the current rule definition approach should be made simpler if possible.
- With user-defined rules and actions, the uses are expected to continue to expand over time
- Enhancements may be added to allows access to data values (not just events) and data based-defined limits, etc.
- We feel that the overall approach is being validated and the power will continue to grow as more and more components are reporting their detailed status on the bus.